UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

In re Flint Water Cases.

Judith E. Levy
United States District Judge

_____/

This Order Relates To:

Bellwether III Cases

_____/

OPINION AND ORDER GRANTING IN PART AND DENYING IN PART DEFENDANTS VEOLIA NORTH AMERICA, LLC, VEOLIA NORTH AMERICA, INC., AND VEOLIA WATER NORTH AMERICA OPERATING SERVICES, LLC'S MOTION TO EXCLUDE OPINIONS AND TESTIMONY OF DR. AARON SPECHT [2916]

Currently before the Court is Veolia North America, LLC, Veolia North America, Inc., and Veolia Water North America Operating Services, LLC's ("VNA") Motion to Exclude Opinions and Testimony of Dr. Aaron Specht ("the Motion"). (ECF No. 2916.) Bellwether III Plaintiffs Y.A., E.A., G.B., C.D., R.E., J.N., and J.S. ("Plaintiffs" or "Bellwether III Plaintiffs"), who were all minor children at the time of the Flint water crisis, oppose the motion. (ECF No. 3013.) VNA replied to

Plaintiffs' submission. (ECF No. 3039.) For the reasons set forth below, the Motion is granted in part and denied in part.

I. Background

The Court's ruling on a similar motion from Bellwether I describes Dr. Specht as follows:

> Dr. Specht has a Ph.D. in medical physics and is a leading expert on the use of portable x-ray fluorescence technology ("pXRF") to assess metal exposures. Dr. Specht has published widely on the use of pXRF to measure bone-lead content in adults, children, and animals. His qualifications as an expert are not in dispute.

In re Flint Water Cases, No. 17-10164, 2021 WL 5356295, at *1 (E.D. Mich. Nov. 17, 2021) ("*Specht I*"). Dr. Specht is currently an assistant professor of health sciences at Purdue University. (ECF No. 3011-6, PageID.101811.)

Plaintiffs retained Dr. Specht to evaluate their exposure to lead. (ECF No. 3013, PageID.101933.) Dr. Specht testifies that the best way to measure lead exposure over time is through bone lead testing. He states that blood lead testing, which is a standard technique, is "incredibly time sensitive" and only captures more recent exposures, especially for

children. (ECF No. 2913-31, PageID.97436–97437.) In *Specht I*, the Court set forth:

> Ordinarily bone lead measurements are taken by a large, stationary "KXRF" device. It takes approximately 30 minutes to get an accurate measurement using KXRF technology. Dr. Specht pioneered the use of the alternative pXRF device. Portable-XRF and KXRF devices measure bone lead in substantially the same way. (ECF No. 330-48, PageID.15629–15630.) Both are applied to the subjects' tibia bone, and both generate raw spectral data which is then processed by a computer to generate a relevant measurement (in this case, lead content) and an associated uncertainty value (the margin of error). Portable-XRF devices are small, easily portable, and require only 3 minutes to complete a measurement.

2021 WL 5356295, at *1. Based on bone lead testing using a pXRF device, Dr. Specht found that Plaintiffs were exposed to lead in varying amounts. (*See, e.g.*, ECF No. 2913-31, PageID.97441.)

In *Specht I*, the Court denied VNA's motion to exclude Dr. Specht's opinions, which was based on the following arguments:

> VNA argues that [Dr. Specht's use of pXRF] is not [reliable], primarily because (1) Dr. Specht's own research shows pXRF measurements of bone lead to be less reliable in pediatric than in adult [subjects] (ECF No. 330-7, PageID.14445–14455), and (2) the lack of bone lead measurements in healthy control populations makes it impossible to assign any significance to the measurements Dr. Specht obtained (*Id.* at PageID.14461–

> 14474). VNA ultimately maintains that Dr. Specht's use of pXRF does not satisfy even a single *Daubert* factor.
>
> VNA further argues that Dr. Specht's testimony should be excluded under Federal Rules of Evidence 401(a), 402, and 403, because it is irrelevant and would be more prejudicial than probative. (ECF No. 330-7, PageID.14475–14479.) Finally, VNA asserts that Dr. Specht's opinion regarding the higher reliability of bone lead measurements when compared to blood lead measurements is unreliable and based on "cherry picked" studies. (ECF No. 330-7, PageID.14480–14481.)

2021 WL 5356295, at *3. Since the Bellwether I trial, the Court ordered Dr. Specht to provide VNA with the MATLAB code[1] used for calibrating the pXRF device and for measuring lead content from the spectral data the device produces. VNA presents new objections to Dr. Specht's testimony based on their experts' review of that code. (ECF No. 2913-3, PageID.96225.)

The Court has already decided two rounds of *Daubert* motions in anticipation of the Bellwether I and the Issues Class trials, amounting to

[1] Dr. Specht explains that "MATLAB [code] is a programming platform designed specifically for engineers and scientists to analyze and design systems. The MATLAB language is a high-performance language for technical computing." (ECF No. 3011-6, PageID.101781 n.1.) He uses MATLAB code to process the data generated by the pXRF device.

seventeen rulings in total. It also considered *Daubert* challenges to experts at the time it certified the Issues Class. *See In re Flint Water Cases*, 558 F. Supp. 3d 459, 523–25 (E.D. Mich. 2021) (deciding two *Daubert* motions out of over a dozen *Daubert* motions VNA filed at the class certification stage). Additionally, when approving the partial settlement, the Court denied objections to using the pXRF device as evidence in the settlement. *In re Flint Water Cases*, 571 F. Supp. 3d 746, 794–812 (E.D. Mich. 2021). Given the Court's familiarity with these experts, it ordered the Parties not to repeat arguments already made and instead ordered them to preserve arguments the Court had already considered by reference to those arguments in earlier filings.[2] (ECF No. 2901, PageID.95084.)

II. Legal Standard

Federal Rule of Evidence 702 governs the admissibility of expert testimony and requires that: (1) the witness must be qualified, (2) the testimony must be relevant, and (3) the testimony must be reliable. Fed. R. Evid. 702; *In re Scrap Metal Antitrust Litig.*, 527 F.3d 517, 528–29 (6th

[2] The Court has also already ruled on seven *Daubert* motions related to Bellwether III. (*See* ECF Nos. 2959, 3007, 3034, 3043, 3078.)

Cir. 2008). As the Supreme Court explained in *Daubert v. Merrell Dow Pharmaceuticals*, Rule 702 imposes a "gatekeeping" obligation on the courts to ensure that scientific testimony "is not only relevant, but reliable." 509 U.S. 579, 589 (1993); *see also Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 147 (1999).

In *Daubert*, the Supreme Court provided a non-exclusive list of factors courts may consider when evaluating reliability: (1) whether the theory or technique at the basis of the opinion is testable or has been tested, (2) whether it has been published and subjected to peer review, (3) what the known error rates are and whether there are standards controlling the technique's operation, and (4) whether the theory or technique is generally accepted. *Daubert*, 509 U.S. at 593; *see also In re Scrap Metal*, 527 F.3d at 529 (listing same factors). Not every factor needs to be present in every instance, and courts may adapt them as appropriate for the facts of an individual case. *Kumho*, 526 U.S. at 150.

"Rejection of expert testimony is the exception, rather than the rule." *United States v. LaVictor,* 848 F.3d 428, 442 (6th Cir. 2017) (quoting *In re Scrap Metal*, 527 F.3d at 529–30)). The burden is on the proponent of the testimony to show by a "preponderance of proof" that

the proffered expert meets the standards of Rule 702 as interpreted by *Daubert*. *Pride v. BIC Corp.*, 218 F.3d 566, 578 (6th Cir. 2000) (quoting *Daubert*, 509 U.S. at 592).

Under Rule 403, the Court "may exclude relevant evidence if its probative value is substantially outweighed by a danger of one or more of the following: unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence." Fed. R. Evid. 403.

III. Analysis

VNA argues that Dr. Specht's "report and opinions should be excluded because his MATLAB code has not been shown to accurately measure low levels of lead in children's bones." (ECF No. 2913-3, PageID.96233.) It also argues that the Court should exclude Dr. Specht's estimate of bone lead half-life and related opinions, because they are unreliable and more prejudicial than probative. (*Id.* at PageID.96246.)

A. Reliability

VNA asserts that Dr. Specht's opinions should be excluded because his MATLAB code has not been subject to peer review and publication, it has high error rates, it has not been tested to verify its ability to detect

low bone lead levels in children, and it is not generally accepted by the scientific community. These arguments based on reliability do not support the exclusion of Dr. Specht's opinions.

i. Peer Review

Because Dr. Specht's MATLAB code has not been subject to peer review and publication, VNA argues that it lacks "any indicia of scientific reliability." (ECF No. 2913-3, PageID.96234.) VNA argues that only Dr. Specht and a VNA expert, Dr. William Huber, have seen the MATLAB code, including Dr. Specht's collaborators and the peer reviewers for his published articles. (*Id.*)

Peer review—including publication in a peer-reviewed journal—is considered under Rule 702 and *Daubert*, because it is a "measure of reliability" indicating that an opinion has been "submitted to the scrutiny of the scientific community." *United States v. Gissantaner*, 990 F.3d 457, 464 (6th Cir. 2021) (quotation omitted). In *Daubert*, the Court explains that "[t]he fact of publication (or lack thereof) in a peer reviewed journal thus will be a relevant, though not dispositive, consideration in assessing the scientific validity of a particular technique or methodology on which an opinion is premised." 509 U.S. at 594.

VNA argues that the peer review factor in the *Daubert* analysis weighs against admission, in part because no one except for Dr. Specht and Dr. Huber has tested the MATLAB code used to measure bone lead levels in this litigation. (ECF No. 2913-3, PageID.96234.) Plaintiffs respond that parts of the MATLAB code have been reviewed by and relied upon by other researchers. (ECF No. 3013, PageID.101940.) Dr. Specht, in a declaration, states that "the framework" for the relevant MATLAB code has been shared with other researchers, some of whom use similar code in their published work. (ECF No. 3011-6, PageID.101781.) While Dr. Specht acknowledges that not every aspect of the code used in his work in Flint has been shared, he asserts that the parts that have been shared relate to "lead levels and uncertainty levels," which is precisely what VNA challenges. (*Id.* at PageID.101782; *see also* ECF No. 3011-7, PageID.101839.) He explains:

> The [] specific parts of the code [used in the Flint Water Cases] have nothing to do with the methodology challenged by [VNA's experts] Dr. Huber and Dr. [Lambertus] Hesselink. Rather, the parts of the code that are Flint specific are related to instrument specific (meaning the specific pXRF being used) numbers, related to the calibration of the instrument, and not my methodology. In other words, the only parts of the code that are unique are the portions of the code related to

> calibrating the actual pXRF being used. Meanwhile, the underlying methodology that the MATLAB code is applying to calculate lead levels and uncertainty values is the same across all devices.

(ECF No. 3011-6, PageID.101784.) That is, according to Dr. Specht, the disputed part of the code has been used by other scientists, including in publications he lists. (*Id.* at PageID.101782.)

VNA also points out that Dr. Specht did not share the MATLAB code with peer reviewers when publishing his research. (ECF No. 2913-3, PageID.96234.) Dr. Specht explains that there would be no reason to submit MATLAB code for peer review during the publication process. He asserts that in his field, submitting the code would make little sense, because the core aspects of the MATLAB code are "known science and not novel to the community as a whole." (ECF No. 3011-6, PageID.101784.)

Based on the record before the Court, the peer-reviewed publications that accepted Dr. Specht's research, which relied upon the pXRF device, did not request the underlying MATLAB code for examination as a condition of publication. That provides support for Dr. Specht's statement that "the contention that the specific MATLAB code itself needs to be peer reviewed is completely foreign in the field of XRF

research." (*Id.*) According to Dr. Specht, experts in this field trust the results of this methodology as capable of producing reliable scientific results without peer review of the underlying MATLAB code.

This suggests that Dr. Specht's methodology has been subject to "the usual rigors of peer review." *Gissantaner*, 990 F.3d at 465 (citation omitted). The "usual rigors" of scientific practice do not require MATLAB code to be submitted for review. That indicates that Dr. Specht's methodology, which includes at least some aspects of the MATLAB code relied upon here, "is taken seriously by other scientists, i.e., that it meets at least the minimal criteria of good science." *Id.* VNA vastly overstates its argument, then, when it claims that the MATLAB code "does not have any indicia of scientific reliability." (ECF No. 2913-3, PageID.96234.)

The peer review factor in the *Daubert* analysis overall favors admission of Dr. Specht's testimony. Dr. Specht's broader methods have been subject to peer review and publication. Scientists rely on pXRF devices and publish research that relies upon it. His colleagues have reviewed and adopted key elements of his methods, including reviewing MATLAB code that is similar to Dr. Specht's code. (*See* ECF No. 3011-6, PageID.101784 (Dr. Specht stating that "the only parts of the code that

are unique are the portions of the code related to calibrating the actual pXRF being used.").) VNA is therefore incorrect that the peer review factor indicates a lack of indicia of scientific reliability for the methodology as a whole.

ii. Error Rates

VNA contends that Dr. Specht's MATLAB code is so error prone that the Court must exclude it as unreliable. VNA argues that the MATLAB code "contains two fatal problems": the way that it identifies and quantifies lead in a sample and the way it generates "uncertainty values." (ECF No. 2913-3, PageID.96235–96238.) It asserts that these flaws lead to "demonstrably false results that confirm that [the MATLAB code] is unreliable": detecting lead in samples known to contain "little or no lead," generating 85% false positive rates when presented with random noise in a simulation created by VNA's expert, reporting negative lead levels in Flint children, and failing to generate results that correlate with results generated by other XRF devices. (*Id.* at PageID.96238–96241.)

a. The MATLAB Code and Lead "Fingerprints"

VNA argues that the MATLAB code functions improperly, because the way the code processes data does not incorporate certain requirements that must be satisfied for lead to be present. (*Id.* at PageID.96235.) VNA invokes the laws of physics, stating that when identifying the presence of lead or other atoms these laws dictate that

> (1) [] peaks [in the spectral data] will always take the shape of a Gaussian (or bell-shaped) curve; (2) the Gaussian curve will always be at least as wide as a minimum width, known as the "Fano limit"; and (3) the Gaussian curve will always be centered around particular energies (colors) that are characteristic of the atoms in the test specimen.

(*Id.* at PageID.96229.) According to VNA's experts' explanation of the "fingerprint" of lead, the peak Dr. Specht seeks to identify is at 12.618 keV (the "L-beta (Lß) peak") and the Fano limit (the minimum width of the curve) is 175 eV. (*Id.*) If the MATLAB code does not identify lead based on the lead fingerprint described above, then it will be unable to distinguish lead from background noise, according to VNA. (*Id.* at PageID.96226.) VNA argues that the bone lead levels identified by Dr. Specht's MATLAB code do not fit the lead fingerprint, which means the

lead levels Dr. Specht identifies may be the result of noise and not lead. (*Id.* at PageID.96236.)

Plaintiffs respond that VNA's objections amount to nothing more than a battle of the experts because Dr. Specht rejects the claim that lead must appear in the form of a specific lead fingerprint. (ECF No. 3013, PageID.101943.) Dr. Specht, in a declaration, offers an alternative account of what is necessary for his pXRF device to properly identify and measure lead in bones. (ECF No. 3011-6, PageID.101788.) Citing several scientific articles, he discusses his approach in terms of "counting statistics," which he explains as follows:

> Counting statistics, in the context of XRF detectors, refers to the statistical analysis of data obtained from XRF measurement experiments. It's a subset of nuclear instrumentation that deals primarily with the quantification or counting of individual particles or quantum events. In XRF we count the number of events at a certain energy in a certain time. These events occur at a predictable average rate, which is proportional to the intensity. The statistical fluctuations in these counts are described by Poisson distribution, a probability distribution that represents the number of events in a fixed interval of time or space.

(*Id.* at PageID.101782 n.3.) Dr. Specht argues that lead counts trend in a Gaussian shape, but "an increase in counts in the energy range

associated with lead" is what "delineate[s] lead." (*Id.* at PageID.101788; *see also id.* at PageID.101797 ("[T]he counts in the lead region for the children identified are being compared within and outside of the lead region to arrive at the given bone lead measurement and uncertainty specific to each child.").) He explains that various factors can shift the center of a Gaussian curve formed by lead counts such that its center may not always be 12.618 keV. (*Id.* at PageID.101788–101789.) He also denies lead measurements must always be in the form of a curve wider than 175 eV. (*Id.* at PageID.101789–101790.)

In VNA's reply, it argues that Dr. Specht's declaration is in tension with the assumption that lead forms a Gaussian curve, which it argues is built into his code and is referenced in his research. (ECF No. 3037-1, PageID.102709–102710.) VNA puts the issue as follows:

> So either lead does not generate a Gaussian curve and Dr. Specht's MATLAB code is unreliable (because the code assumes lead generates a Gaussian curve), or lead does generate a Gaussian curve and Dr. Specht's scans of Plaintiffs do not show lead (because the curves fitted by Dr. Specht's code are far too narrow, and often in the wrong location, to represent lead).

(*Id.* at PageID.102710.)

It is not clear why Dr. Specht's use of Gaussian curves in his MATLAB code requires him to accept VNA's experts' views about lead fingerprints. Dr. Specht does not believe the curves he fits to his data are too narrow or in the wrong location to identify lead, because his methodological assumptions differ from VNA's experts' assumptions. Whether the lead fingerprint described by VNA's experts must guide Dr. Specht's analysis is in dispute. As a result, Dr. Specht's discussion of these issues does not create a contradiction, nor does it undermine his methods. *Cf. United States v. Smallwood*, No. 5:08–CR–38, 2010 WL 4168823, at *5–6 (W.D. Ky. Oct 12, 2020) (excluding an expert's opinion and noting the contradiction between an expert's published studies and his opinion). Instead, VNA's experts have presented what they believe are core requirements for a proper analysis of these issues, and Dr. Specht denies that these requirements apply.

In the "classic battle of the experts," it is up to the jury to weigh what "weight and credibility" to afford each expert's opinion. *Phillips v. Cohen*, 400 F.3d 388, 399 (6th Cir. 2005) (citation omitted). Further, "[t]he test set out in *Daubert* does not require that the Court look to one expert to determine the credibility of another expert's determination."

Fox v. Mass. Bay Ins. Co., No. 2:13-cv-02567, 2015 WL 11017961, at *3 (W.D. Tenn. Mar. 12, 2015). On their own, these competing accounts of what a reliable approach to lead detection in bone should look like cannot be resolved by the Court. Disagreements over method alone do not create a basis for exclusion, and VNA has not demonstrated that Dr. Specht's bone lead testing was the result of speculation, a contradiction, or a more general lack of a reliable foundation. Instead, they have presented their experts' dispute with Dr. Specht about the importance of lead fingerprints in properly determining the Bellwether III Plaintiffs' bone lead levels. *See In re Scrap Metal*, 527 F.3d at 529–30.

b. The MATLAB Code and Uncertainty Values

VNA also argues that Dr. Specht's approach to determining uncertainty values for his measurements is flawed. Dr. Specht's methodology generates an uncertainty value when the pXRF is used to measure lead in bone. (ECF No. 3011-6, PageID.101788.) After performing bone scans on the Bellwether Plaintiffs, Dr. Specht found that lead was present when the amount of lead detected was greater than the uncertainty value. (*See, e.g.*, ECF No. 2913-31, PageID.97441 (calculating one Plaintiff's bone lead level as 1.42 ug/g, calculating the

measurement uncertainty as 0.49 ug/g, and concluding that they were exposed to lead).)

Daubert instructs courts to consider "the known or potential rates of error" for a methodology. 509 U.S. at 594. If a method has "a high error rate, if it has trouble avoiding false positives, and if there are no standards or guidelines to avoid or lessen these risks," then this factor weighs against admission. *Gissantaner*, 990 F.3d at 465 (cleaned up). The Sixth Circuit instructs that even when the calculation of an error rate has "troubling" deficiencies, including the failure to conduct certain important tests, error rate "is only one in a list of nonexclusive factors that the *Daubert* Court observed would bear on the admissibility question." *United States v. Bonds*, 12 F.3d 540, 560 (6th Cir. 1993).

VNA argues that Dr. Specht's MATLAB code calculates rates of error in a manner that ignores important considerations and ignores possible results. (ECF No. 2913-3, PageID.96238 ("[I]t does not employ any statistical method to determine whether the peak it attempts to measure was generated by noise or an actual lead signal, and it does not account for the limit of detection of the device[.]"); ECF No. 3037-3, PageID.102760 (Dr. Huber stating that the code "does not capture all the

uncertainty associated with Dr. Specht's measurements").) VNA also argues that the MATLAB code used to measure lead in the Bellwether Plaintiffs' bones does not calculate error in the same manner as Dr. Specht does in his publications and, if he had done so, it would have shown that no lead was detected in these Plaintiffs. (ECF No. 2913-3, PageID.96238; ECF No. 3037-3, PageID.102761.)

Dr. Specht denies this characterization of how the code produces uncertainty values. Citing his publications, he asserts that the code "inherently accounts for limits of detection and uses standard error propagation to determine the uncertainty of the measurement." (ECF No. 3011-6, PageID.101798–101799.) He also claims that Dr. Huber mischaracterizes how the MATLAB code generates uncertainty values. (*Id.* at PageID.101792–101793.)

If VNA's experts are correct, and Dr. Specht's MATLAB code cannot calculate a proper error rate, this deficiency would weigh against admission. But VNA does not establish such a deficiency. The parties' disagreement about how the code accounts for uncertainty and error and whether the code mirrors the equations in Dr. Specht's publications are not questions for the Court to decide. *In re Scrap Metal*, 527 F.3d at 529–

30 (ruling that under Rule 702 and *Daubert* courts should not decide between contested versions of the facts and citing with approval *Quiet Tech. DC–8, Inc. v. Hurel–Dubois UK Ltd.*, 326 F.3d 1333, 1343–44 (11th Cir. 2003), where testimony was admitted even though "the appellant argued that the expert . . . used the wrong equations to run the analysis"). The Court's role is not to assess the credibility of the experts' factual statements about what computer code is doing when it processes data. *Phillips*, 400 F.3d at 399; *Fox,* 2015 WL 11017961, at *3. The Court will not resolve these factual disputes or weigh the credibility of experts with competing accounts of how the computer code generates results. VNA therefore does not establish any deficiency in error rate calculation or any unreliability in Dr. Specht's methods. *See Gissantaner*, 990 F.3d at 465.

Next, VNA argues that the alleged flaws related to error rate result in "demonstrably false results that confirm that [the MATLAB code] is unreliable." (ECF No. 2913-3, PageID.96238–96241.) The Court considers VNA's additional arguments regarding error rate below.

c. Measurements of Lead in Phantoms as Evidence of Error

Dr. Huber points to the example of "phantoms" to show that Dr. Specht's methodology is error prone. Phantoms are plaster of paris

samples that are used for calibrating pXRF devices. Dr. Specht employs this calibration process to account for "subtle differences" between instruments used for lead measurement. (ECF No. 3011-7, PageID.101833–101834.) Dr. Specht used phantoms "with known lead level[s]" for this purpose. (ECF No. 2913-31, PageID.97441.) According to Dr. Huber's analysis, Dr. Specht's code generates clear errors when applied to data generated by such phantoms. (ECF No. 2913-29, PageID.97258.) In his deposition, Dr. Specht stated that the phantoms he used have 0.48 µg/g of lead. (ECF No. 2913-33, PageID.97542.) Dr. Huber found that

> the code reports detections as high as 12.37 µg of lead per gram of bone mineral in these phantom bone control samples, far higher than the bone lead concentrations reported in the plaintiffs. 10/26/23 Report at ¶¶ 21-24. This illustrates that the code can mistakenly interpret background noise as lead and generate false positive readings exceeding 10 µg/g, even when no lead is present.

(ECF No. 2913-29, PageID.97265.) On its face, a measurement of 12.37 µg/g appears to be a highly inaccurate result. Some measurements were closer to 0.48 µg/g, but it appears that there were several significantly inaccurate readings. (*See id.* at PageID.97258–PageID.97261 (including

readings of 2.63 ± 1.03 µg/g, 3.78 ± 2.04 µg/g, 4.42 ± 1.42 µg/g, among other readings, some of which were closer to 0.48 µg/g).)

While the code yielded incorrect measurements of lead concentration when applied to the phantoms, Dr. Specht explains that "the code is calibrated only for human bone measurements." (ECF No. 3011-6, PageID.101799, 101801.) According to Dr. Specht, Dr. Huber has not revealed a flaw in the code, because the code was never meant to provide accurate measurements of lead in something like a phantom.

However, in VNA's reply, it points out that Dr. Specht's comments in his published work imply that phantoms can be used for calibration, because XRF spectra from bone and those from phantoms are not significantly different. (*See* ECF No. 3037-1, PageID.102711.) At oral argument, Plaintiffs explained that VNA misconstrues Dr. Specht's comments in his published work. (ECF No. 3081, PageID.105981 ("[T]he way that the spectra comes out of pXRF is the same. . . across different materials [but] is distinct from what the MATLAB code does with that spectra[.]"); *id.* at PageID.105982–105983 ("[H]e's explaining that there are . . . similarities in the way the pXRF reads the spectra, but that

doesn't mean that the MATLAB code calculation will be exactly the same for the phantom versus wet bone versus dry bone[.]").)

Plaintiffs explain that Dr. Specht's code is not intended to perform measurements of lead in phantoms, though the device can still be calibrated using such phantoms. The fact that the MATLAB code is unable to accurately perform a task for which it is not intended does not show that it is unreliable or error prone. Nor do these results require the Court to conclude that there are any problems with Dr. Specht's calibration of the device, given that calibration is apparently separate from other data processing the device performs. (ECF No. 3011-6, PageID.101784 (stating that the parts of the code that generate measurements of lead and uncertainty values are different from the parts of the code that address calibration of a specific instrument).)

d. Monte Carlo Simulation as Evidence of Error

Dr. Huber also tested the MATLAB code using a so-called Monte Carlo simulation and found an 85% false positive rate.[3] (ECF No. 2913-

[3] The Fifth Circuit provides a brief explanation of the Monte Carlo method:

> Monte Carlo measures the probability of various outcomes, within the bounds of input variables . . . . Instead of simply averaging the input values, Monte Carlo analysis uses randomly-generated data points to

3, PageID.96239.) VNA explains that "Dr. Huber fed the [MATLAB] code spectra data consisting of random noise with no lead signals present, modeled on actual noise from spectra generated by the pXRF device that were produced in this litigation." (*Id.*) Essentially, Dr. Huber generated random noise that could not have indicated the presence of lead and tested how Dr. Specht's MATLAB code would respond to it. That random noise is supposed to be realistic (i.e. it is the type of fluctuation that the pXRF might encounter in the real world), because it was modeled on "the random fluctuations observed in the 67 spectra Dr. Specht produced in the case." (ECF No. 2913-29, PageID.97266.) Dr. Huber obtained a wide range of results in the test, but 85% were false positives, because the measured concentration of lead did not exceed its measurement uncertainty, meaning Dr. Specht's method would have found lead to be present despite the spectra being random noise. (*Id.*) VNA argues that

---

> increase accuracy, and then looks to the results that those data points generate. The methodology is particularly useful when reaching an exact numerical result is impossible or infeasible and the data provide a known range—a minimum and a maximum, for example—but leave the exact answer uncertain.

Lyondell Chem. Co. v. Occidental Chem. Corp., 608 F.3d 284, 293 (5th Cir. 2010).

finding this level of lead when none was present shows that Dr. Specht's results cannot be distinguished from those based on random noise. (ECF No. 2913-3, PageID.96240.)

Plaintiffs object to the way this simulation was carried out. Dr. Specht argues that Dr. Huber did not actually use a Monte Carlo method, because he did not generate the random data "within the bounds of real-world parameters." (ECF No. 3011-6, PageID.101799, 101802.) Also, because actual data related to lead is not random, Dr. Specht asserts that Dr. Huber's method of "using random numbers for data is not going to adequately identify the potential variation in methodology." (*Id.* at PageID.101800.) It will miss out on "complex interactions" that would occur in real life. (*Id.* at PageID.101802.) Dr. Specht also insists that he and his co-authors have verified this method via experiment. (*Id.* at PageID.101800.) VNA responds that Dr. Specht's code is supposed to distinguish between noise and lead, and Dr. Huber's simulation shows that the code fails to do that. (ECF No. 3037-1, PageID.102711–102712.) Dr. Huber expresses disagreement about whether he performed a valid Monte Carlo simulation, but he does not elaborate beyond noting his disagreement. (ECF No. 3037-3, PageID.102757 n.1).

If Dr. Huber's simulation offered clear evidence that Dr. Specht's code was unable to distinguish noise from lead, that would speak to the error rate factor in the *Daubert* analysis, but the significance of the simulation is subject to disagreement. The dispute here appears to be whether Dr. Huber's test relies on data (i.e. the simulated noise) that is adequately like real background noise to test the reliability of Dr. Specht's code. Experts retained by the parties offer differing opinions on this question. Dr. Huber's response to Dr. Specht is a conclusory statement of his disagreement. (*Id.*) This record does not allow the Court to resolve this issue without impermissibly weighing the credibility of two competing experts' testimony. *See Jahn v. Equine Servs., PSC*, 233 F.3d 382, 391 (6th Cir. 2000). As a result, the Court cannot determine whether Dr. Huber's results address the way Dr. Specht's code functions in real-world conditions, as opposed to the simulated conditions created by Dr. Huber. This evidence therefore does not weigh in favor or against the admissibility of Dr. Specht's opinions.

e. Negative Lead Levels as Evidence of Error

VNA also argues that "the MATLAB code reported *negative* lead levels for more than 200 of Dr. Specht's bone scans of Flint children."

(ECF No. 2913-3, PageID.96240 (emphasis in original).) Because having a negative measurement of lead in a person's bones is not possible, VNA asserts that these results are further evidence of the code's inability "to distinguish between noise and a true lead signal." (*Id.*) Dr. Specht does not disagree that the code reported negative lead levels. He states that such a result is "expected" and explains that if there were tests where "bone lead [was] nearly zero" and a high level of uncertainty, that would yield a negative value. (ECF No. 3011-6, PageID.101803.) Such a result does not demonstrate lack of reliability. It is how the code expresses results. Dr. Specht indicates that his published work includes such negative results. (*Id.*)

VNA provides no substantive response to Dr. Specht's explanation. Further, insofar as this data was included in published work, that suggests it is consistent with scientific practice and not something the scientific community would view as evidence of a lack of reliability. VNA's argument that negative lead levels indicate a lack of reliability therefore fails.

f. Lack of Correlation Between pXRF and KXRF as Evidence of Error

VNA also contends that the pXRF is unreliable because of its failure to correlate with more established KXRF technology. VNA refers to KXRF as the "gold standard" in this context—an assessment Dr. Specht shares. (ECF No. 2913-3, PageID.96226; ECF No. 2913-29, PageID.97268 (citing Dr. Specht referring to the KXRF as the "gold standard").) VNA focuses its critique on measurements at lower—but still substantial—lead levels. Based on the data included in the papers, Dr. Huber estimates that when lead concentrations are measured at "30 µg/g or less by the pXRF device, the [correlation with the KXRF] was essentially zero." (ECF No. 2913-29, PageID.97269.) Rather than its measurements correlating with the KXRF device, the pXRF device tends to overreport lead levels relative to the KXRF device, according to VNA. (ECF No. 2913-3, PageID.96241.)

Plaintiffs respond that although one study found less of a correlation between pXRF and KRXF than expected, another one found significant associations between the measurements taken by the two devices despite "all but one individual [having] bone lead results less

than 30 ug/g." (ECF No. 3013, PageID.101948.) Dr. Huber found, however, that the correlation identified in the study was the result of one bone lead level that was at a much higher level than the others and that measurements below 15 µg/g did not correlate at all. (ECF No. 2913-36, PageID.97732.) His analysis leads him to conclude that the "pXRF is biased high by 2.5 ppm." (*Id.*)

Even if there is a lack of correlation between pXRF and KXRF as Dr. Huber asserts, this failure to correlate to a different established methodology goes to the weight of the evidence and not admissibility. *See Best v. Lowe's Home Ctrs.*, 563 F3d 171, 181 (6th Cir. 2009) ("Admissibility under Rule 702 does not require perfect methodology. Rather, the expert must employ[ ] in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field." (cleaned up)). Scientists, including Dr. Specht, use pXRF for lead detection in published work, which indicates Dr. Specht's methods in this litigation have a similar level of rigor to the practice of experts in this field. Any lack of correlation to KXRF challenges the accuracy of this method, but it does not establish the device's lack of

reliability. *See In re Scrap Metal*, 527 F.3d at 529 (distinguishing accuracy from reliability).

g. The Evidence Related to Error Rates

VNA presents two general arguments about the flaws in Dr. Specht's MATLAB code. On their own, these objections—about how the MATLAB code identifies lead and calculates uncertainty values—amount to a battle of the experts that does not provide a basis for exclusion. As further support for their position, VNA offers four arguments, grounded in its experts' analysis of evidence, to establish the MATLAB code is flawed. As set forth above, while these arguments point to possible flaws in Dr. Specht's approach, they do not justify exclusion of his opinions. Nor do they establish a high error rate or inability to avoid false positives under the error rate factor of the *Daubert* analysis. The error rate factor does not favor exclusion.

iii. Testability

VNA argues that Dr. Specht has not tested the code to confirm it can identify low levels of lead in children's bones. In support of this argument, VNA points to studies considering the correlation between pXRF and KXRF results, (ECF No. 2913-3, PageID.96241), and studies

that indicate potential limitations in the context of testing children's bones. (*Id.* at PageID.96241–96242.) It adds that no further studies have been done to verify Dr. Specht's methodology with respect to children and that Dr. Specht has not published research based on his work in Flint. (*Id.*)

The Court has already addressed related arguments from VNA. Although the Court acknowledged that the available research was not definitive on its own, it noted improvements to Dr. Specht's process, as well as research showing that longer measurement times and "altered calibration settings [] improve accuracy." *Specht I*, 2021 WL 5356295, at *4. VNA argues that these studies do not "validate the MATLAB code for measuring low levels of bone lead like those at issue in this case." (ECF No. 2913-3, PageID.96242.)

Plaintiffs point out that VNA's entire argument here applies an improper standard. As the Court has explained, the testability factor in the *Daubert* analysis asks

> whether a witness' technique or technology could be falsified or refuted through the scientific method. *United States v. Gissantaner*, 990 F.3d 457, 464 (6th Cir. 2021) (citing *United States v. Bonds*, 12 F.3d 540, 559 (6th Cir. 1993)). "An

> untestable scientific theory is all theory and no science." *See Gissantaner*, 990 F.3d at 463.

Specht I, 2021 WL 5356295, at *3. VNA's arguments are about whether Dr. Specht's methodology has been tested—not whether it is testable. Arguments "about the adequacy of the [theory's] testing . . . provide grist for adversarial examination, not grounds for exclusion." *Gissantaner*, 990 F.3d at 464 (cleaned up). Dr. Specht's methodology is clearly testable and Dr. Huber purports to have tested it.[4] Accordingly, just like the last time

[4] Putting to the side that VNA relies on the wrong standard, it also argues that Dr. Specht's claim that the pXRF device successfully detected lead in Plaintiffs is an untested hypothesis and is therefore unsuited for admission due to being speculative. (ECF No. 3037-1, PageID.102714.) VNA cites *Tamraz v. Lincoln Elec. Co.*, which involves an expert who admitted to speculating about brain damage that he had been unable to detect in his examination of the plaintiff. 620 F.3d 665, 675–76 (6th Cir. 2010). Here, Dr. Specht references repeated experiments being used to verify his methodology and grounds core elements of his methodology in established research, among other things. (ECF No. 3011-6, PageID.101782–101783, 101800.) This methodology is unlike the speculation at issue in *Tamraz*.

Further, many of the arguments offered by VNA relate to application of the methodology to low blood levels. (ECF No. 3037-1, PageID.102714.) Arguments about application are rarely a basis for exclusion. *See Specht I*, 2021 WL 5356295, at *6. As the Court set forth:

> The pXRF technology itself is widely accepted in the scientific community. Recent publications likewise validate the use of pXRF to measure bone lead in human subjects specifically. Defendants may cast doubt on the application of this technology to the children in this case—but the trial is the appropriate place for such arguments, and a jury the appropriate audience.

the Court considered the admissibility of Dr. Specht's opinions, "the testability factor weighs strongly in favor of admission." *Specht I*, 2021 WL 5356295, at *3.

iv. General Acceptance

VNA argues that Dr. Specht's methodology has not been generally accepted, which weighs against admission. (ECF No. 2913-3, PageID.96245.) General acceptance is one of the factors outlined in *Daubert*:

> "general acceptance" can [] have a bearing on the inquiry. A "reliability assessment does not require, although it does permit, explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community." *United States v. Downing,* 753 F.2d, at 1238. See also 3 Weinstein & Berger ¶ 702[03], pp. 702–41 to 702–42. Widespread acceptance can be an important factor in ruling particular evidence admissible, and "a known technique which has been able to attract only minimal support within the community," *Downing,* 753 F.2d, at 1238, may properly be viewed with skepticism.

Id. Insofar as VNA's focus is on application that is a further reason its arguments fail.

509 U.S. at 594. The Sixth Circuit has explained that "[o]nly when a theory or procedure does not have the acceptance of most of the pertinent scientific community, and in fact a substantial part of the scientific community disfavors the principle or procedure, will it not be generally accepted." *Bonds*, 12 F.3d at 562.

To show that Dr. Specht's methodology is not generally accepted, VNA makes several arguments. It suggests that pXRF testing and the MATLAB code discussed in this motion have not been independently evaluated. (ECF No. 2913-3, PageID.96244.) VNA points out that Dr. Specht references peer-reviewed publications that he co-authored rather than those authored by other people and that others (including government agencies) have not adopted the pXRF. (*Id.* at PageID.96244–96245.) It also notes that Dr. Specht has not sought FDA approval, which would require review of the MATLAB code for safety and efficacy. (*Id.* at PageID.96245.)

Plaintiffs point out that the Court has considered many of these arguments already. The Court explained that

> while Dr. Specht is the pre-eminent figure in the development of pXRF in in vivo studies, he is hardly the only researcher in this field. Indeed, in each of the studies to which both parties

> refer, Dr. Specht has several collaborating co-authors. E.g., (Specht (2014), Specht (2019a)). And the large-scale Zhang study of subjects in Indiana and Chicago was completed largely without Dr. Specht's involvement, by a separate group of researchers. Zhang (2021).
>
> In addition, the pXRF technology at issue in this case is not as novel as VNA suggests. Portable XRF devices have a long history of use in non-medical contexts. . . . Dr. Specht's own methods have been subjected to almost a decade of peer review, and they have not come under attack as unscientific or otherwise lacking.

Specht I, 2021 WL 5356295, at *5. In Dr. Specht's deposition, he also explains that his research—undertaken with co-researchers—continues to use pXRF technology very similar to what he used to test Plaintiffs. (*See* ECF No. 3011-7.)

Dr. Specht's status as co-author on peer-reviewed publications that rely upon pXRF is evidence of general acceptance. The fact that other scientific researchers have worked with Dr. Specht on past and current research using his methods weighs in favor of finding that they are generally accepted. Even if he worked on this research entirely on his own, the general acceptance factor is not reducible to the number of people who use a methodology. *See United States v. Jones*, 965 F.3d 149,

156, 160, 162 (2d Cir. 2020) (finding that although a laboratory was the only one that used a methodology, it was still generally accepted based on peer review and other approvals from the scientific community).

VNA has not provided evidence that this methodology is disfavored, *Bonds*, 12 F.3d at 562, nor does it point to evidence that the scientific community views Dr. Specht's work as "unscientific or otherwise lacking." *Specht I*, 2021 WL 5356295, at *5. Rather, there is evidence this methodology has been evaluated and adopted by members of the scientific community. The general acceptance factor therefore favors admission. To the extent VNA intends to attack this methodology's applicability to children or to certain bone lead levels, those arguments relate to applicability and are appropriate for presentation to a jury. *Id.* at *6. They do not justify exclusion of this evidence. Accordingly, VNA's arguments based on general acceptance fail.

Overall, the *Daubert* analysis favors admission of Dr. Specht's opinions. While some of VNA's arguments regarding the error rate may expose flaws in Dr. Specht's methodology, even that factor does not favor exclusion. These factors are not "a definitive checklist or test" but are instead intended to guide courts in "strik[ing] a balance between a liberal

admissibility standard for relevant evidence on the one hand and the need to exclude misleading 'junk science' on the other." *Best*, 563 F.3d at 176–77 (cleaned up).

Dr. Specht's opinions and methodology are not junk science. He is qualified to offer his opinions, and he draws on his peer-reviewed and published research to do so. VNA's experts' competing scientific theories, its experts' criticisms and objections, and its views on the proper application of Dr. Specht's methodology may be raised at trial, but they do not provide a basis to exclude this testimony. Accordingly, VNA's arguments for excluding Dr. Specht's testimony in its entirety are denied.

B. The Half-Life of Lead in Children and Related Opinions

VNA also objects to Dr. Specht's opinion that bone lead levels in children have a five-year half-life. (ECF No. 2913-3, PageID.96246.) It further objects to several opinions Dr. Specht offers on the basis of this assumption, some of which are included in the following portion of Dr. Specht's report:

> The lead exposure results from Flint were drastically higher than comparable community studies. The bone lead of the children in Flint had an average measure of 4.1 ± 6.6 ug/g. These results from the Flint children were 6.5 times higher

> than Ontario children from the McNeil study (McNeill, Fisher et al. 2017). Using a conservative estimate of 5 years for the bone lead half-life in children, we calculate the bone lead values to be 8.2 ± 13.1 ug/g at the start of the Flint water crisis. With these distributions, the population overlap with Chinese children from Specht et al., which had blood lead values of >25 ug/dL, would be greater than 66% (Specht, Lin et al. 2016). This means that 66% of the children from Flint had bone lead and lead exposure profiles most similar to severely poisoned children that were prescribed chelation therapy (Specht, Lin et al. 2016).

(ECF No. 2913-31, PageID.97440.)

VNA makes three arguments opposing the admission of these opinions. First, it argues that Dr. Specht does not cite any scientific literature in support of his opinion about five-year half-life of bone lead in children nor does he otherwise disclose the basis of this estimate. (ECF No. 2913-3, PageID.96246–96247.) Second, VNA argues that that his estimates of bone lead values of Flint children in 2014 are based on unfounded assumptions about when their exposure to lead occurred. (*Id.* at PageID.96247) Third, VNA contends that Dr. Specht makes an illegitimate comparison to "severely poisoned children in his China study." (*Id.*) In addition, VNA argues that these opinions should be excluded under Rule 403 as unfairly prejudicial.

Dr. Specht provides citations for his estimate of the half-life of lead in children. Dr. Specht, in his declaration, states that he calculated a five-year half-life "based on known bone turnover markers identified in previous studies." (ECF No. 3011-6, PageID.101807.) In his deposition, Dr. Specht explains that "there is not literature specific to lead in bones, but there is literature specific to the bone turnover rates." (ECF No. 2913-32, PageID.97513.) He cites a source in his declaration that gives bone remodeling rates for subjects at different ages. *Basic Anatomical and Physiological Data for Use in Radiological Protection: The Skeleton*, ANNALS ICRP, 1995, at 35. https://journals.sagepub.com/doi/pdf/10.1177/ANIB_25_2. Dr. Specht provided his calculations related to this opinion to VNA after his deposition. (ECF No. 3011-6, PageID.101807 n.14 (noting he provided the calculation to counsel).)

Experts are permitted to make reasonable scientific inferences from data. *See Jahn*, 233 F.3d at 390. However, under Rule 702, the burden is on Plaintiffs to show by a preponderance of the evidence that testimony is based on sufficient facts or data. Fed. R. Evid. 702. Further, there must not be "too great an analytical gap between the data and the opinion proffered." *Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 146 (1997). Plaintiffs

did not provide the basis for Dr. Specht's inference from bone remodeling rates at different ages to his estimate of the half-life of bone lead in children. (*See* ECF No. 3081, PageID.106006.) It is unclear how and whether the source Dr. Specht cites, which relates to bone remodeling rates, allows him to estimate the half-life of *lead* in bones. Plaintiffs also do not provide support for Dr. Specht's claim that his estimate for bone lead half-life is "conservative." (ECF No. 2913-31, PageID.97440.) Further, it is unclear how he accounts for the differing ages of Flint children in calculating a five-year half-life. The Court therefore cannot conclude that Dr. Specht's estimate is more likely than not based on sufficient facts and data. Dr. Specht may not offer testimony about his five-year estimate for bone lead half-life.[5]

---

[5] Although Dr. Specht's testimony about his estimate of bone lead half-life is inadmissible, that does not prevent him from testifying about the significance of Plaintiffs' bone lead levels based on other evidence in the record. For example, the Court's ruling does not preclude Dr. Specht from providing the following sort of opinion, which is stated in his report:

> since bone turnover is faster at younger ages, [] the initial lead exposure from the water crisis is higher than what we are seeing here. Thus, [Plaintiff] has a measurable exposure to lead that had accumulated in [Plaintiff]'s bones, and the exposure was at a level that the natural bone turnover rate did not dissipate the lead prior to our XRF measurement.

(ECF No. 2913-31, PageID.97441.)

Because Dr. Specht's extrapolations of average bone lead levels for children in Flint and his comparison to his study of children in China are based on his estimate of a five-year bone-lead half-life, those opinions must be excluded, as well.

Exclusion of his comparison of children in Flint with children in his study in China is also necessary to prevent unfair prejudice and confusion. Fed. R. Evid. 403 ("The court may exclude relevant evidence if its probative value is substantially outweighed by a danger of one or more of the following: unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence.") The probative value of this comparison is weak because Dr. Specht states that this comparison "only refer[s] to the *potential* cumulative, chronic exposure distribution overlap in the Flint children versus the children that were lead poisoned in China." (ECF No. 3011-6, PageID.101808 (emphasis added).) He offers an opinion about a *potentially* valid comparison, which suggests a lessened likelihood that this testimony will assist the jury. *See* Fed. R. Evid. 702(a). In part because the probative value of this comparison is weak, it is substantially outweighed by the danger of unfair prejudice and confusion. Specifically,

there are serious risks that the comparison to the study of Chinese children could lead jurors to conclude that Plaintiffs required chelation treatment to remove lead from their bodies like the children in China that Dr. Specht compares them to. *Old Chief v. United States*, 519 U.S. 172, 180 (1997) ("Unfair prejudice . . . means an undue tendency to suggest decision on an improper basis. . . ."). Yet there is no evidence the Bellwether III Plaintiffs required or other children in Flint obtained chelation for lead poisoning. These problems compound the issues with Dr. Specht's estimate of bone-lead half-life set forth above. As a result, these opinions must be excluded.

Accordingly, as set forth above, VNA's motion is granted in part with respect to Dr. Specht's opinions related to his estimate of bone lead half-life.

IV. Conclusion

For the reasons set forth above, the Motion is GRANTED IN PART and DENIED IN PART.

IT IS SO ORDERED.

Dated: September 9, 2024
Ann Arbor, Michigan

s/Judith E. Levy
JUDITH E. LEVY
United States District Judge

CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing document was served upon counsel of record and any unrepresented parties via the Court's ECF System to their respective email or first-class U.S. mail addresses disclosed on the Notice of Electronic Filing on September 9, 2024.

s/William Barkholz
WILLIAM BARKHOLZ
Case Manager